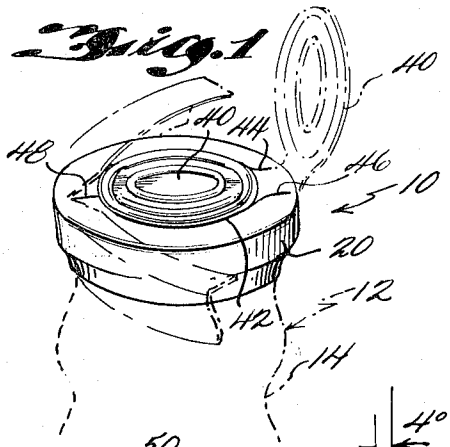
April 19, 1966 J. F. SCHARF ETAL 3,246,784

CONTAINER AND CLOSURE THEREFOR

Filed May 14, 1964

Fig. 1



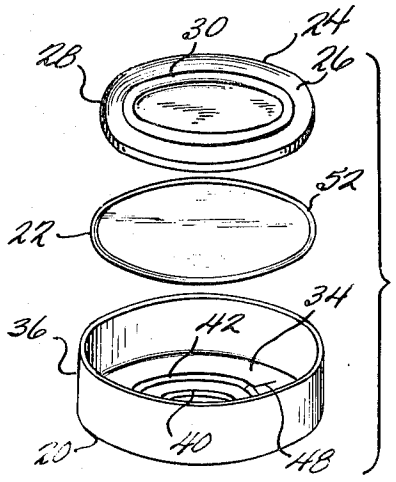


Fig. 2

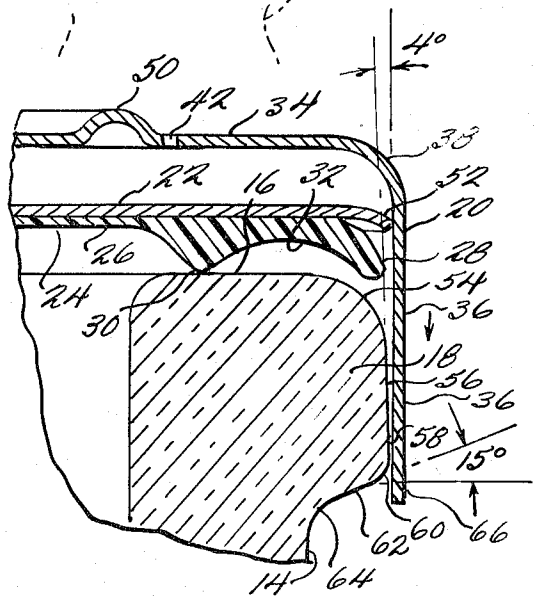
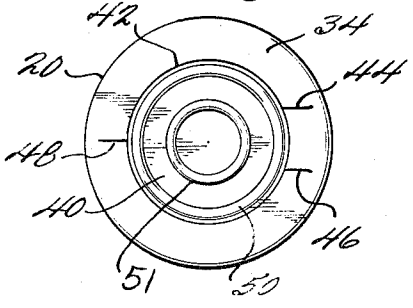


Fig. 4

Fig. 3



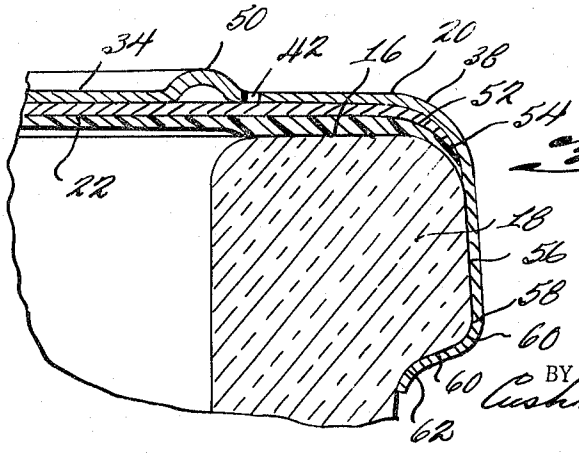


Fig. 5

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CONTAINER AND CLOSURE THEREFOR

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The present invention relates to an improved container and closure and, more particularly, to an improved container and closure therefor capable of use in packaging liquids such as carbonated beverages and beer under pressure.

Heretofore in containers such as bottles or cans having a neck, a lip at the mouth of the neck and a bead around the neck immediately below the lip, metallic closures having liners have been used to seal the same when packaging liquids under pressure, for example, carbonated beverages or beer. The closures have been either crowns or shell shaped structures having a top wall and a cylindrical side wall, the cylindrical side wall being rolled into engagement with the bead of the container. Many prior efforts have been made to provide a closure for such containers where the product is under pressure, the closure being removable without the use of special bottle openers, coins or the like. However, such prior efforts have not proved entirely satisfactory because of leakage or because the closure was too expensive to make. Also, the use of closures having pull tabs thereon has heretofore been known but such prior efforts have been limited to the packaging of liquids or materials which were not under pressure as they did not have the necessary sealing power.

Throughout the specification and claims the container is often referred to by the term "bottle" and it is intended that such a term covers either glass or plastic containers or metallic containers which are sometimes referred to as cone type cans. In any event the term "bottle" covers any container of the type provided with a neck portion, a lip and a bead around the neck portion for receiving a closure such as a crown or a rolled on shell structure.

An object of the present invention is to provide an improved type of closure for use with a bottle in packaging products under pressure, the closure being provided with a pull tab so that it is capable of removal without the necessity of special instruments such as a bottle opener or the like.

Another object of the present invention is to provide a three piece closure for bottles having means for removing the outer shell, the three piece closure having improved sealing ability even though the outer shell of the same is provided with incisions therethrough for use in removing the same.

Still another object of the present invention is to provide an improved closure or cap made of three pieces and having an outer shell provided with a pull tab, the outer shell further being provided with means to assist the removal of the same after the pull tab has been operated to sever the side wall of the shell.

Another important object of the present invention is to provide an improved closure and bottle therefor which is capable of packaging products under pressure.

A further important object of the present invention is to provide an improved and novel bottle structure having a mouth portion capable of receiving either a shell type cap which is rolled thereon or a "crown" type cap which is crimped, the bottle mouth configuration being such that it provides better sealing ability between the closure and the bottle as well as a stronger holding ability of the closure on the bottle.

Ancillary to the preceding objects it is a further object of the present invention to provide an improved closure for a bottle having an improved mouth profile or configuration, the closure having a pull tab thereon so that it is capable of removal from the bottle without the necessity of auxiliary opening devices.

These and other objects and advantages of the present invention will appear more fully in the following specification, appended claims, and drawings, in which:

FIGURE 1 is a perspective view of an improved bottle with the improved closure mounted thereon, the view illustrating in broken lines the pull tab for the closure being operated and further the shell or skirt of the closure being pivoted open;

FIGURE 2 is an exploded inverted view of the three piece closure of the present invention, the parts being in their static form prior to their application as a closure on a container;

FIGURE 3 is a top elevational view of the shell structure for the closure of the present invention;

FIGURE 4 is an enlarged fragmentary vertical sectional view through the improved closure and the mouth of the improved bottle of the present invention, the view illustrating the closure being applied to the improved bottle; and

FIGURE 5 is an enlarged fragmentary vertical sectional view similar to FIGURE 4 but illustrating the closure applied to the bottle and rolled under the bead on the neck of the bottle.

Referring now to the drawings wherein like characters or reference numerals refer to like or similar parts, the closure of the present invention is generally designated by the numeral **10** and is applied to an improved bottle of the present invention generally designated by the numeral **12**. The bottle **12** as pointed out heretofore may be a glass or plastic container. Also, it may be a metallic container of the type commonly referred to as a cone type can. The body (not shown) of the bottle may assume any shape, the bottle **12** being provided with a neck **14** having at its upper end an outwardly facing lip **16** and further being provided with a bead **18** around the neck **14** immediately below the lip **16**. A more detailed description of the configuration of neck **14**, lip **16** and bead **18** of the improved bottle **12** will follow later in the specification after a detailed description of the closure **10**.

The closure or cap **10** includes three elements, namely, an aluminum shell structure **20**, a metallic disc **22** and a sealing liner **24** preferably made of a plastisol or the like. The plastisol liner **24** is very flexible and may be made, for example, of the material disclosed in U.S. Patent 3,047,176 issued July 31, 1962, to Eibie A. Wilckens and assigned to the same assignee as the instant application. Also, the plastisol liner **24** may have the same configuration as disclosed in the aforementioned patent in that it is provided with a relatively thin web portion **26** having a downwardly curved peripheral edge portion **28** with an annular downwardly depending boss portion **30** spaced inwardly of the curved edge portion **24**, and having a diameter suitable to engage the lip **16** of the container **12** on which it is being used. The curved peripheral edge portion **28** is curved in the same direction as the boss portion **30** thereby providing an annular channel or groove **32** therebetween which provides room for the expansion or cold flow of the boss when the closure **10** is capped onto the bottle under the usual pressure.

The shell structure **20**, as mentioned before, is made of soft aluminum and has a cross-sectional thickness of .008 to .009 inch and, consequently, such a shell structure is relatively flexible when compared with a shell structure or a conventional crown closure made of steel. In more detail, the shell structure **20** has a relatively flat top wall

34 and a cylindrical side wall 36 connected to the periphery of the top wall 34 by means of a curved portion 38. The curved portion 38 has an inside radius of curvature of approximately 1/16 of an inch.

Provided in and forming a part of the top wall 34 of aluminum shell structure 20 is a pull tab 40 which is used for opening the container 10. The pull tab 40 is provided in the top wall 34 by an arcuate incision or cut 42 completely therethrough, the arcuate incision 42 being greater than a semicircular arc but less than a full circle, and a pair of parallel incisions or cuts 44 and 46 therethrough providing continuous extensions from the ends of the arcuate incision 42. The parallel incisions 44 and 46 extend outwardly in the plane of the top wall 34 toward but terminate short of the cylindrical side wall 36. The top wall 34 on the portion thereof outwardly of the arcuate incision 42 is provided with a radial incision or cut 48 completely therethrough intersecting the arcuate incision 42 at a point on its arc midway between its ends, the radial incision or cut 48 extending therefrom radially outwardly toward the periphery of the top wall 34 but terminating short of curved edge portion 38 and the cylindrical side wall 36. As mentioned above, all of the incisions or cuts in the top wall, namely, the incisions 42, 44, 46 and 48, are completely through the thickness of the aluminum shell structure 20 as clearly evident in FIGURES 4 and 5.

In order to stiffen the pull tab 40 over that of the other portions of the shell structure 20, so as to enhance its utility when being used to open a bottle, an annular reinforcing rib or bead 50 is provided around the periphery of the tab adjacent the arcuate incision 42 and across the portion of the tab between the inner ends of the incisions 44 and 46. The rib 50 may be provided by a pressing or embossing action when the shell structure 20 is formed either before or after the incisions are made therein. Preferably, the annular reinforcing rib 50 is formed prior to cutting the incisions in the top wall of the shell structure 20 so as not to provide too big an opening between the portion of the top wall outside of the tab 40 and the tab itself. A second reinforcing rib or bead 51 of smaller diameter than the rib 50 may be provided on the tab 40 concentrically inwardly of the rib 50.

The metallic disc 22 is provided with a downwardly curved peripheral edge portion 52, the edge portion 52 having a radius of curvature greater than the radius of curvature of the curved portion 38 between the top wall 34 and the cylindrical side wall 36 of the shell structure 20. The metallic disc 22 is preferably made of stainless steel having a cross-sectional thickness of .006 inch, but it may be also made of aluminum or other metal. However, since the closure is primarily intended for use in bottling carbonated beverages and beer, the metallic disc 22 is stiffer than the aluminum shell structure 20 as it provides a stiffened backing for the sealing liner 24. The metallic disc 22 may be coated with shellac or other adhesive so that when the shell structure 20, disc 22 and plastisol sealing liner 24 are assembled prior to capping, they can be adhered to one another in the usual manner. On the other hand, the closure 10 may be assembled with the three elements 20, 22 and 24 loose with respect to one another and oftentimes this makes the removal of the shell 20 and the opening of the bottle 12 easier after the capping operation without impairing the efficiency of the closure.

Referring now specifically to FIGURES 4 and 5 it will be noted that the bottle 12, which is provided with the usual neck 14, has a mouth including the lip 16 and the bead 18 immediately below the lip and surrounding the upper portion of the neck. The novel and improved configuration of the mouth of the bottle 12 provides for efficient, and tighter sealing of a closure made of aluminum, the closure being either the conventional crown type of closure having a side wall or skirt which is corrugated or fluted, or a closure of the type in which the cap includes an aluminum shell having a side wall or skirt which is cylindrical in shape and rolled onto the mouth of the bottle. Additionally, the design of the configuration of the mouth of the bottle enhances the use of closures having a pull tab with severed incisions or cuts in the top wall of the same, as it permits holding of the shell of such closures tightly so as to maintain the backing disc for the liner in proper position with sufficient pressure to provide a good seal for a product packaged under pressure.

In more detail, lip 16 has an annular planar upwardly facing surface which is arranged to engage the liner of a closure. The bead 18 has a first outwardly and downwardly curved surface 54 which is tangential to the annular upwardly facing surface of the lip 16, the curved surface 54 having a radius of curvature in the order of 1/16 of an inch. As will be noted, the radius of curvature of the curved surface or wall portion 54 is substantially identical to the radius of curvature of the portion of the closure 10 connecting the side wall or skirt 36 with the top wall 34. A first frusto-conical wall portion 56 extends downwardly and outwardly from the lower edge of the curved portion 54, its connection with the lower edge of the curved portion 54 being substantially tangential. The frusto-conical wall portion 56 of bead 18 has an angle with a vertical in the order of four degrees, the lower edge or base 58 of the frusto-conical wall portion 56 being connected to a second but inwardly curved surface or wall portion 60 having a radius in the order of 1/64 of an inch. The second curved portion 60 which is substantially tangential with the frusto-conical wall portion 56 at the base of the same, has its other end connected to a second but inverted frusto-conical wall portion 62. The second frusto-conical wall portion 62 which extends downwardly and inwardly has an angle to a horizontal in the order of 15 degrees. A third curved surface or wall portion 64 provides a smooth continuation of the exterior wall surface of the bead 18 into the neck 14. However, it will be appreciated that if the bottle is a cone type metallic can, the third curved portion 64 will not be necessary. In all probability, a reversed curved edge portion will be used, the reversed curved edge portion defining a small annular stiffening bead for the main bead. As is evident from FIGURE 4, the maximum diameter of the bead 18 at the base of the first frusto-conical wall portion 56 is substantially equal to the inner diameter of the cylindrical side wall 36 of aluminum shell 20.

The operation of the structure shown in FIGURES 1–5 inclusive may be described briefly as follows: The closure 10 is formed by assembling the aluminum shell structure 20, the metallic disc 22, and the plastisol liner 24 so that the metallic disc 22 is interposed between the inside of the top wall 34 of the shell 20 and the sealing liner 24. If these elements or parts are assembled without adhering of the elements to one another they will assume the position shown in FIGURE 4. On the other hand, if the three elements of the cap or closure 10 are adhered to one another then the upper surface of the metallic disc 22 will be contiguous with the inner surface of upper wall 34 of the shell 20, the upper surface of the sealing liner 24 being contiguous with the lower surface of the metallic disc 22. In this latter form of assembly of the cap structure, the peripheral curved or rolled edge 52 of the metallic disc will be further curved to the same curvature as that of the curved edge portion 38 for the shell 20 by a suitable pressing operation and, thus, will have proper sealing and frictional contact with the shell 20 in addition to being adhered thereto.

Once the cap or closure 10 has been assembled in either of the manners described above and it is desired to close a bottle, the closure 10 is pressed over the mouth of the bottle 12 and with its skirt or side wall 36 depending downwardly about the bead 18 as shown in FIGURE 4. By a suitable rolling and downwardly pressing operation the lower free edge 66 of side wall 36 is stretched around

the curved wall portion **60** and onto the frusto-conical wall portion **62** of the bead **18**. Since the shell **20** of the cap **10** is made of aluminum and is rolled and pressed downwardly and formed about the bead, the major portion of the cylindrical wall **36** of the shell **20** is also stretched and form fitted to the frusto-conical portion **56** of the bead **18** so that it too assumes a frusto-conical shape in that portion which is contiguous with the frusto-conical wall portion **56**. As pressure is applied to the cap **10**, the boss **30** of the liner **24** coacts with the planar upwardly facing surface of lip **16** and expands or cold flows into the channel **32**, thus, forming a very effective seal across the entire planar surface of the lip **16**. The downwardly curved portion **28** of liner **24** fits tightly against the curved portion **54** of bead **18** as shown in FIGURE 5.

Once a cap **10** has been applied to the bottle **12** and it is desired to open the same, the pull tap **40** is elevated as shown in broken lines of FIGURE 1 and then pulled so as to rip down the side wall **36** of the aluminum shell structure **20**. When this has been accomplished with the tab being completely torn through the side wall **36** and removed therefrom, the remaining portion of the shell **20** is pivoted open about the hinge point on the side wall **36** provided by the slit **48** in the top wall **34** and from this position, which is also shown in broken lines in FIGURE 1, the remaining portion of the shell **20** is easily removed. It is then a very simple matter to remove the metallic disc **22** and liner **24** by lifting the same from the mouth of the container **12**.

One important advantage of the detailed arrangement described is that an aluminum cap structure can be tightly secured onto the mouth of a container, especially containers having contents filled under pressure. Also, another important advantage is obtained in that a very tight seal can be maintained across the lip **16** due to the configuration of the lip **16** as well as the detailed configuration of the bead **18** which restrains the shell in a proper closing position. By utilizing a bead having the frusto-conical portions **56** and **62** with the lower frusto-conical portion being inverted with respect to the upper frusto-conical portion, the curvature of the frusto-conical portions each about its own single axis assist in tightly retaining the shell **20** in position on the bottle **12**, especially when the shell is aluminum. In contrast, if the bead had merely a circular configuration in cross-section or if it had the combination of a curved configuration with a cylindrical configuration, the shell is not retained as securely on the bottle and does not apply sufficient pressure to the liner of the closure.

By providing a three piece cap structure with a metallic disc as the intermediate element thereof, the metallic disc having a curved peripheral edge with a greater radius curvature than the radius of curvature of the curved wall portion between the top and side walls of the shell, the assembly of such cap and the application of such cap to a bottle further enhances the retention of the cap on the bottle as the curved peripheral edge of the intermediate metallic disc is further deformed to the shape of the curved portion of the shell, thus, applying additional interior forces on the shell which are advantageous to the retention of the shell on the bottle and the provision of greater sealing power of the liner.

While the invention as described in the specification, illustrated in the drawing and claimed accomplishes all of the objects and advantages enumerated, it is to be understood that various possible changes or modifications could be made to the disclosed structure without departing from the spirit of the invention. Therefore, the terminology used in the specification is for the purpose of description and not for limitation as the scope of the invention is defined in the claims.

What is claimed is:

1. An improved three piece closure for use in packaging carbonated beverages, beverages under pressure, and beer comprising: an aluminum shell structure having a top wall and a cylindrical side wall depending downwardly therefrom and connected thereto by a curved edge portion, said cylindrical side wall having a lower free edge portion capable of being rolled about a bead on a container mouth, said top wall having an arcuate incision therethrough larger than a semicircle and a pair of parallel incisions therethrough extending toward and terminating short of the side wall, said parallel incisions providing extensions of the ends of said arcuate incision and together with said arcuate incision defining a pull tab lying normally in the plane of and forming a part of the top wall; a metallic disc inserted within said shell and having a curved peripheral edge with a radius of curvature greater than the radius of curvature of the curved edge portion of said shell structure, said metallic disc having a diameter substantially equal to the inside diameter of the cylindrical side wall; and a disc shaped plastisol sealing liner inserted within said shell structure and covering the metallic disc, said liner having a curved peripheral edge portion and a circular boss spaced inwardly therefrom and extending in the same direction for making sealing engagement with the lip of a container.

2. A closure as claimed in claim **1** in which said top wall is provided with a radial incision, said radial incison being in the portion of the top wall outside of the tab and intersecting with and extending from said arcuate incision intermediate its ends toward and terminating short of the cylindrical side wall.

3. A closure as claimed in claim **1** in which said metallic disc is stainless steel having a cross sectional thickness of about 0.006 inch.

4. A closure as claimed in claim **1** in which said metallic disc is aluminum and is stiffer than said aluminum shell structure, having a cross sectional thickness of about 0.008 to 0.009 inch.

5. A closure as claimed in claim **1** in which said metallic disc and said plastisol liner are adhered to each other and to said shell.

6. A closure as claimed in claim **1** in which the pull tab defined by the arcuate and pair of parallel incisions includes a full circular reinforcing rib positioned closely adjacent the peripheral edge portion of the tab around the arcuate incision and extending across an area of the tab between the parallel incisions at points where the same join the arcuate incision.

7. A closure as claimed in claim **6** in which the distance between the parallel incisions is less than a diameter of the arcuate incision.

8. An improved three piece closure for use in packaging carbonated beverages, beverages under pressure, and beer comprising: an aluminum shell structure having a top wall, a cylindrical side wall depending downwardly therefrom and connected thereto by a curved edge portion, said cylindrical wall having a lower free edge portion capable of being rolled about a bead on a container mouth, said top wall having a continuous arcuate incision therethrough larger than a semicircle and a pair of spaced parallel incisions therethrough extending toward and terminating short of the side wall, said parallel incision providing extensions of the ends of said arcuate incision and together with said arcuate incision defining a pull tabe lying normally in the plane of and forming part of the top wall, a full circle reinforcing rib provided on the tab and positioned closely adjacent the peripheral edge portion thereof formed by the arcuate incision and extending across an area of the tab between the parallel incisions where the same join the arcuate incision, said top wall further having a radial incision on the portion thereof outwardly of the pull tab and extending toward and terminating short of the cylindrical side wall, said radial incision intersecting said arcuate incision intermediate its ends; a stainless steel disc stiffer than said shell structure, said disc being inserted into said shell structure and having a curved downwardly ex-

tending peripheral edge with a radius of curvature greater than the radius of curvature of the curved edge portion of said shell structure, said stainless steel disc further having an overall diameter substantially equal to the inside diameter of the cylindrical wall of said shell structure; and a disc shaped plastisol sealing liner inserted within the shell structure and covering the stainless steel disc, said plastisol liner having a downwardly curved peripheral edge portion and a circular boss spaced inwardly and extending downwardly therefrom for sealing engagement with the container lip.

9. A closure as claimed in claim **8** in which said steel disc and said plastisol liner are adhered to each other and to said shell structure.

10. In combination: a bottle for use in packaging carbonated beverages, beverages under pressure, and beer, said bottle having a neck portion, an outwardly facing lip at the end of said neck portion, and a bead on said neck portion and circumscribing the same immediately below the lip of the bottle, said lip having an annular planar upwardly facing surface, said bead having a first curved portion extending from the outer peripheral edge of said annular planar surface of the lip, a first frusto-conical wall portion extending downwardly and outwardly from said first curved portion and having an angle in the order of 4° with respect to a vertical, a second curved portion extending inwardly from the base of said frusto-conical wall portion toward the neck portion, a second and inverted frusto-conical wall portion having its base extending from said second curved portion, said second frusto-conical wall portion of said bead having an angle in the order of 15° with respect to a horizontal; and a closure rolled about the bead of said bottle, said closure comprising an aluminum shell structure having a top wall and a cylindrical side wall depending downwardly and connected thereto by a curved edge portion, said cylindrical wall having a lower free edge portion rolled about said second curved portion of said bead into continuous relationship with said second frusto-conical wall portion with the remaining portion of the cylindrical wall of said closure being stretched over and contiguous with said first frusto-conical wall portion of said bead; and a liner within said shell structure forming a seal

with said planar surface of said lip and said first curved portion of said bead, said liner including a metallic disc having a downwardly curved peripheral edge and a diameter substantially equal to the diameter of the cylindrical wall of said shell structure, and a disc-shaped liner element covering said disc and contacting the planar surface of said lip and the first curved portion of said bead, said metallic disc having its peripheral edge further curved when said shell structure is attached to the bottle and stretched about the bead on the neck of the bottle.

11. A structure as defined in claim **10** in which said shell structure is provided with an arcuate incision in its top wall greater than a semi-circle and a pair of spaced parallel incisions extending from the ends of the arcuate incision toward and terminating short of the cylindrical wall of the shell, said arcuate incision and said parallel incisions defining a pull tab.

12. A structure as defined in claim **11** in which said shell structure further includes a radial incision on the portion of the top wall outwardly of the arcuate incision, said radial incision intersecting said arcuate incision at a mid point between its ends and extending toward but terminating short of the cylindrical wall of said shell.

References Cited by the Examiner

UNITED STATES PATENTS

775,651	11/1904	Heath	215—46.48
1,472,093	10/1923	Shull	215—46
2,544,969	3/1951	Underwood	215—46
2,731,165	1/1956	Hohl	215—40
2,963,189	12/1960	Tourre et al.	215—40
3,033,407	5/1962	Isele-Aregger	215—39
3,047,176	7/1962	Wilckens	215—40
3,130,056	4/1964	Taylor et al.	215—40

FOREIGN PATENTS

502,247	11/1954	Italy.
75,146	6/1917	Switzerland.

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